Micropyretics Heaters International

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First Named Inventor: Ramgopal Vissa
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Application Control Number: 10/726,487
Art Unit 3742
Application: A Flexible Die Heater

To: Examiner Leonid M. Fastovsky

We thank once again the examiner for his thoughtful analysis and patience with our application. The amended claims are enclosed. Please note the following:

Specification

1. Claim 3 (currently amended) the information have been corrected: in Claim 3, line 2, the word "of" has been deleted and in line 4 the word "each" has been changed to - - said at least one - -.

Explanation for non obviousness on 35USC 103 Rejections

2. The following explanation is offered and Claim 3 is further amended. Based on the comments below we request allowance of the claims.

3. We respectfully wish to point out to the examiner that the Campbell patent (5,915,072) is limited in use as a surface heater as Campbell et. al. (5,915,072) deliberately reduce the heating efficiency (Col 2, Line 13-16) and (Col 15, Line 9-10). Only thus i.e., by limiting the infrared potential are Campbell et. al. (5,915,072) able to have a post under the lamp (20 in Figure 2). However, clearly as inferred by Campbell (5,915,072), such a post in likely to heat and distort, if the full range of infrared heating is allowed. Our invention clearly claims in the last line of Claim 3 "at least one swivel point for a 360° rotation lies on a non-radiation side of module". Thus there is no limitation on power of radiation in our invention. Note that a 180° rotation along the normal axis to the bulb axis is not possible in the

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Campbell (5,915,072) patent. The system as shown in the Campbell (5,915,072) patent lacks two swivel points which is required by our Claim 3. On combining Campbell (5,915,072) and Ellersick (4,159,411) we find the same limitation. The examiner correctly points out that Ellersick (4,159,411) teaches an infrared heating apparatus 10 with flexible frame comprising two modules 12 attached to one another by a one pivot 16 and rotatable 180° *on the x-axis*. Precisely herein lies another reason why the combination cannot have been anticipated to teach our patent application. In fact, if anything, it would teach away from our patent application. Our Claim 3 is very clear on this distinction (Line 10, Claim 3) which says "is attached to at least two swivel points". This is a critical distinction which allows any apparatus made by in conformance to Claim 3 as being truly flexible *with full power*. We have now also added the last line to Claim 3 which goes on to now say, "and the said apparatus may be used at it's fully rated power in all configurations." Claim 4 is also amended to claim the apparatus..."comprise of at least two or more swivel points."

4. By considering the argument made above and the currently amended Claim 3, we respectfully again request that the objection to Claim 8 under 35 U.S.C. 103 be removed as being unpatentable over Campbell (5,915,072); Ellersick (4,159,411); and Stephensen (4,494,316).
5. The 35 U.S.C. 103 (a) rejection for Claim 11 as being unpatentable over Campbell (5,915,072) in view of Ellersick (4,159,411) and further Van Putten et. al. (5,533,567) is similarly requested to be removed based on the arguments presented in point #3 above. Further, Van Putten (5,533,567) teaches only a rigid structure and only claims rotation of an *injected fluid* not the rotation of the heater. These are not equivalent for heat flow as one is convective and the other (our invention) is radiative (preferred for surface heating). We request this rejection to be removed.

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We hope that we have shown that our invention is indeed novel and unanticipated previously. We point out also that if Campbell (1999) (5,915,072) and Ellersick (1976) (4,159,411) could have been combined, one would have seen products in the marketplace with such multiple swivel features at full power for use as surface heaters. To the best of our knowledge, prior to the products of our invention, we have not encountered any such products.

We respectfully request allowance of the currently amended claims 3, 4, 7-11.

Thank you.

Sincerely,

JA Sekhar
(for inventors)

750 Redna Terrace, Cincinnati, Ohio 45215, USA TEL 513-772-0404 FAX 513-672-3333
EMAIL sales@mhi-inc.com WEB www.mhi-inc.com

DETAILED DESCRIPTION OF FIGURES

Figure 1 and 2 are illustrative of concept of radiative heating and convective heating by gas and ionized medium in the gas respectively. The circles in both figures represent objects placed in the heating furnace. In figure 1 the straight arrows represent line of sight radiation and the curved arrows represent convention. In figure 2 the long curvy arrows represent convection and the short arrows represent heat deposition from ions. Radiative heating is a line of sight heating (normally fast) and convective heating is slow unless very high velocity jets are used. The use of such jets would preclude large area coverage. The presence of ionization assists convective heating but it is difficult to have large concentrations in normal atmosphere pressures as ions easily recombine with free electrons. This is the basis of the invention i.e. a flexible IR system which can be used to eliminate the non-uniformity and provide rapid optimized heating.

Figure 3 shows the flexible system with a flexible frame (overall figure) and modules **15** with swivels. Note the x, y, and z axes shown in the figure. These axes are consistent in the figures to follow. The swivel points are typically where rotation is possible. Note modules radiate in one direction and swivel points are on the other side of the module or on the side as shown. **11** and **16** show the typical 360 degree swivel points (better illustrated in figure 4) and the 180 degree

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swivel point is shown in **12**. The flexible frame **10** allows the multiple units to retract and expand in order to allow any in-plane swivel. **13** is a post that allows the entire system to be placed in a stable fashion. **14** are flaps which can also swivel. The flaps **14** may be used to deflect energy and also not allow energy to escape. The swiveling of the flaps is controlled by the flap adjusters **17**. The flaps swivel on the x-axis and in the same manner may swivel on the y-axis once the modules **15** are rotated. **19** are the (heaters) also called bulbs (inside the module) and define the bulb or heater axis plane (which could be any axis on the x-y plane).

Figure 4 shows typical rotation of the entire assembly **65** along the plane normal to the bulb **64** axis (which in this figure is any axis which lies on the x-y plane). In this figure, **61** is the frame, **62** is a swivel point, **63** is the flap swivel point, **64** is the bulb and **65** is the flexible frame which can move around other swivel points in order to accommodate module rotation as shown in the overall assembly **65**.

Figure 5, illustrates the unique total flexibility of the figure to be able to hug a complex surface shown in figure 7. In figure 5, the various key features show **22** a swivel point, **23** is the post, **21** is a flap swivel point, **24** is the flap and **25** is a single module. Note again a 360° swivel is allowed around the z-axis and a 180°

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swivel is possible about the y-axis (or z-axis which is normal to the plane of the paper).

Figure 6 highlights how the swiveling and flexible frame on a single module feature may be used for heating walls **50**, or floors **51**, which are at an angle to each other. This is a typical paint remover configuration. **40** is the heated area on the wall **50**. **43** is a knob (also swivel point) which is used for swiveling the module **53** about the x-axis. For a single module as shown, in Figure 6, **42** is the base, **41** is the retractable or expandable frame, **46** is the handle **47** is a electrical switch, **48** is a post through which electrical feed through of wires is possible, **48** is the flap (which can also swivel about the x-axis), **53** is the flap holder and swivel point, **44** is an high-low power switch. The IR heater namely bulbs **49** can barely be seen in this view and lie along the x-axis. (The x-y plane is the floor **51**). Z is the vertical axis.

Figure 7 shows an overall die press assembly **70**. **79** is the press shaft on the die plate leveler **71**. The die post **72** and the die platter **74** along with the lower and upper die **77** and **78** align with the help of the guide **75**. The IR heater assembly **73** with swivel points **81** and **85** and foldable flaps **85** may be used to heat such a complex die press assembly **70**. The IR heater posts **81** and frame **82** allow the swivel points to provide the 180° and 360° flexibility along (i.e. any axis which lies on the x-y plane) and normal to the bulb axis (i.e. the z-axis). The

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bulb axis in this figure is along the length of the module (the module plane is normal to the z-axis) which are shown in the heater assembly **73**.

As clarification we note that as explained in the detailed description of Figure 3, the x-axis is the heater or bulb length axis and for this figure is also the axis which is parallel to the major dimension of the module. It is understood that by extrapolation that any axis on the x-y plane could have been considered as an equivalent axis. The x-y plane in Figure 3 is also the plane of heating. In the claims, reference is made to cartesian axes. Cartesian axes are commonly known in the literature. A clear definition is given for example on the web site www.whatis.com.

One of the key uniqueness of the invention is that the fully rated power of the apparatus of the invention may be used in all configurations, namely in any tilt condition.

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